

# Helical Wheel Diagrams

As described in the last section, proteins consist of a sequence of amino acids. Each amino acid can be described as hydrophobic, hydrophilic or ambivalent. A hydrophobic molecule is one which dislikes having water near it. These amino acids are generally found buried inside a globular protein or imbedded in a lipid membrane (ie -places where water isn't). A hydrophilic molecule likes to have water near it, water is attracted to it. An ambivalent molecule is one that is in between the two extremes.

Here is a catagorization of the 20 most common amino acids :

Hydrophilic:

N	Asparagine
Q	Glutamine
D	Aspartic Acid
E	Glutamic Acid
K	Lysine
R	Arginine
H	Histidine

Ambivalent:

A	Alanine
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P	Proline
W	Tryptophan
G	Glycine
S	Serine
T	Threonine
C	Cysteine
Y	Tyrosine

Hydrophobic:

V	Valine
L	Leucine
I	Isoleucine
F	Phenylalanine
M	Methionine

Biochemists use this (and many other factors) to help them predict the conformation and function of proteins. If a protein is in an  $\alpha$ -helical conformation, it helps to know which way the various amino acids point when viewed from the top. This is the purpose of a helical wheel diagram.

For  $\alpha$ -helices, there are 3.6 amino acids per turn of the helix. So, each

amino acid is rotated 100 degrees from the previous one. To create a helical wheel diagram, bring up the appropriate panel, then enter the 1 letter amino acid sequence (or transfer it from the Amino Acid Inspector). You can use upper or lower case letters. After you press return, the diagram will be displayed. Any unrecognized letters will be changed to lower case, recognized ones will be changed to upper case. For verification purposes, the molecular weight and number of residues (amino acids) is also displayed. The molecular weight is without the terminating water ( $H + OH$ ).

Currently only one style of diagram is supported. Hydrophobicity is represented by distance from the center of the diagram. Flags are present for inverting this (so hydrophilic molecules are out and hydrophobic ones are in), adding circles at the 3 radii, and removing the ambivalents from the diagram. The entire window can be printed, or the wheel diagram can be saved as EPS for importing into another document.